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ABSTRACT

Reported are the results of the 1975 survey of federal and industrial spending for research and development (R&D) activities. Data are presented for comparison with 1974 data. Major findings include: R&D spending rose 5%, to $23.3 billion; Federal funds to R&D rose 5%, to $8.8 billion; industry funds to R&D rose 5%, to $14.8 billion; energy R&D spending rose 18%, to $1.4 billion; basic research spending rose by 4%, to $700 million; industry applied research spending rose 6%, to $4.4 billion; and the number of full-time-equivalent R&D scientists and engineers rose 1%, to 362,500. (SL)

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SCIENCE RESOURCES STUDIES HIGHLIGHTS

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Energy Increase of 18 Percent Paces Industrial R&D Spending in 1975

- Industry spent $23.5 billion on R&D activities in 1975, an increase of 5 percent over the 1974 level of $22.4 billion. In constant dollars, however, this represents a decrease of 4 percent between the 2 years (chart 1). Based on companies' expectations in the spring of 1976, total industrial R&D spending in 1976 should exceed $25 billion.

- Both Federal R&D funds to industry and company R&D spending rose 5 percent between 1974 and 1975, the former increasing to $8.8 billion and the latter to $14.8 billion.

- Total energy R&D spending by industry increased 18 percent between 1974 and 1975 to $1.4 billion with Federal energy R&D support increasing nearly 30 percent to $620 million. Company funds rose 10 percent to $807 million. Industry projects a 1976 total energy R&D level of nearly $1.6 billion.

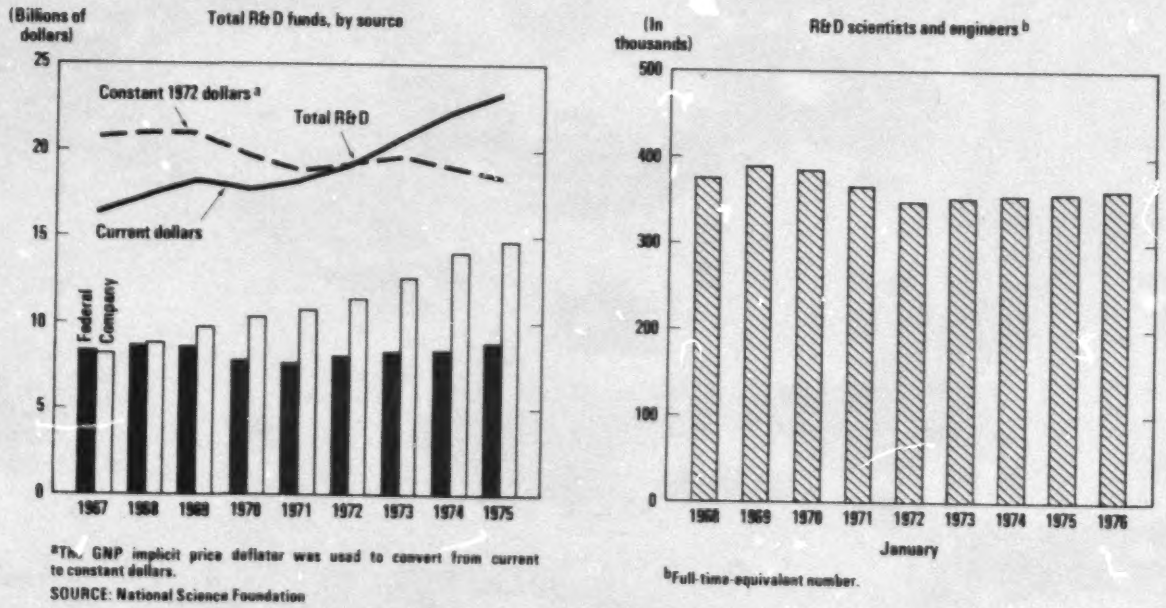
- Expenditures for pollution abatement research and development amounted to about $650 million in 1975, down 1 percent from 1974.

- For the first time in over a decade, the ratio of total industrial R&D spending to net sales for all R&D-performing manufacturing companies registered an increase, rising from 3.0 percent in 1974 to 3.1 percent in 1975, primarily as a result of slower sales growth than in the past.

- Basic research spending by industry increased by 4 percent between 1974 and 1975 to $700 million. Industrial applied research spending amounted to $4.4 billion in 1975, up 6 percent over 1974, while development increased 5 percent between the 2 years to $18.4 billion.

- Between January 1975 and January 1976 the full-time-equivalent (FTE) number of R&D scientists and engineers rose 1 percent to 342,500 (chart 1). This marked the fourth consecutive year that employment of R&D professionals in industry has increased.

CHART 1: R&D resources in industry: 1967-76



[a]The GNP implicit price deflator was used to convert from current to constant dollars.

SOURCE: National Science Foundation

[b]Full-time-equivalent number.

Prepared in the Industry Studies Group, Division of Science Resources Studies

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Total R&D Funds, 1975

Industry, which accounts for some 70 percent of the total U.S. R&D effort each year, spent $23.5 billion on these activities in 1975. This was 5 percent above the 1974 figure of $22.4 billion (table 1).

Six industries accounted for 85 percent of the total industrial R&D effort in 1975. They were aircraft and missiles, $5.7 billion; electrical equipment and communication, $5.5 billion; machinery, $2.7 billion; chemicals and allied products, $2.6 billion; motor vehicles and motor vehicle equipment, $2.3 billion; and professional and scientific instruments, $1.0 billion. The motor vehicles industry was the only one of the six to show a decrease between 1974 and 1975 (chart 2). This was primarily attributable to a 10-percent drop in automotive emission R&D work. All of the remaining five industries showed increases between the two years, ranging from 1 percent in electrical equipment to 11 percent in chemicals. The small increase in R&D funding in the electrical equipment industry reflects an 11-percent drop in Federal R&D funding, primarily attributable to lower defense R&D spending.

With both company R&D funds and Federal R&D spending in industry increasing 5 percent between 1974 and 1975, the company-financed portion of total industrial research and development remained at its all-time high of 63 percent in 1975. During that year, company R&D spending reached $14.8 billion and Federal R&D funds to industry amounted to $8.8 billion.

ENERGY AND POLLUTION ABATEMENT R&D

Total industrial R&D spending related to energy amounted to $1.4 billion in 1975, up 18 percent from the previous year's level of $1.2 billion (table 2). In 1976 industry expects to increase its energy R&D effort by 10 percent to $1.6 billion.

Over 85 percent of industry's energy R&D effort was in the nuclear and fossil fuels areas in 1975 (table 3). The largest relative increases between 1974 and 1975, however, were in geothermal, (250 percent), solar (157 percent), and energy conservation and utilization (170 percent).

Table 1.—Selected industrial R&D data
[Dollars in millions]

Industry	Total R&D Funds		1975 R&D Funds					R&D Scientists and Engineers	
	1974	1975	Federal	Company	Basic Research	Applied Research	Development	Jan. 1975	Jan. 1976
Total[1]	$22,399	$23,535	$8,761	$14,775	$700	$4,396	$18,439	360,400	362,500
Food and kindred products	294	318	1	318	25	115	179	6,900	7,300
Textiles and apparel	69	64	1	63	1	22	41	1,800	1,600
Lumber, wood products, and furniture	64	68	(1)	(1)	(1)	(1)	53	1,900	1,900
Paper and allied products	237	253	1	252	8	84	162	5,000	4,900
Chemicals and allied products	2,377	2,650	240	2,411	276	1,026	1,348	44,900	46,600
Industrial chemicals	1,320	1,459	227	1,232	157	600	702	22,100	22,400
Drugs and medicines	701	804	(1)	(1)	97	298	409	13,100	14,200
Other chemicals	356	387	(1)	(1)	22	128	237	9,800	10,100
Petroleum refining and extraction	623	700	31	669	36	326	337	8,400	8,800
Rubber products	290	288	30	258	3	61	223	6,100	6,100
Stone, clay, and glass products	187	186	1	184	12	60	114	4,100	4,200
Primary metals	311	365	9	356	11	154	200	5,500	5,900
Ferrous metals and products	158	178	2	176	(1)	(1)	111	3,200	3,200
Nonferrous metals and products	153	187	8	180	(1)	(1)	89	2,300	2,600
Fabricated metal products	292	311	15	296	6	61	245	7,100	7,000
Machinery	2,482	2,659	373	2,286	29	326	2,304	43,600	42,700
Office, computing, and accounting machines	1,546	1,662	302	1,360	23	172	1,468	25,500	25,000
Electrical equipment and communication	5,496	5,531	2,515	3,017	192	866	4,473	95,000	94,500
Radio and TV receiving equipment	51	43	(1)	(1)	(1)	(1)	32	1,000	1,000
Electronic components	450	470	218	252	24	69	378	10,600	10,900
Communication equipment & communication	2,979	2,936	1,285	1,651	147	422	2,367	51,600	49,900
Other electrical equipment	2,016	2,082	(1)	(1)	(1)	(1)	1,696	31,800	32,800
Motor vehicles and motor vehicles equipment	2,394	2,339	335	2,003	11	158	2,170	26,100	25,400
Other transportation equipment	31	28	3	25	(1)	(1)	24	900	700
Aircraft and missiles	5,318	5,724	4,527	1,198	47	639	5,039	67,600	67,400
Professional and scientific instruments	989	1,032	181	851	13	108	911	16,500	17,100
Scientific and mechanical measuring instruments	116	125	26	99	3	15	108	3,800	4,100
Optical, surgical, photographic, and other instruments	873	907	155	751	11	93	802	12,700	13,000
Other manufacturing industries	174	189	(1)	(1)	(1)	(1)	139	4,100	4,300
Nonmanufacturing industries	771	830	495	335	22	330	477	14,900	16,100

[1] Not separately available but included in total.
Source: National Science Foundation

Table 2.—Total industrial R&D expenditures for energy and pollution abatement by industry: 1974-76
[Dollars in millions]

Industry	Energy			Pollution abatement		
	1974	1975	1976 (est.)	1974	1975	1976 (est.)
Total	$1,213	$1,427	$1,577	$657	$651	$663
(Federal funds)	482	620	(...)	51	44	(...)
(Company funds)	731	807	(...)	606	607	(...)
Electrical equipment and communication	389	461	516	16	17	15
Petroleum refining and extraction	375	412	450	63	66	60
Aircraft and missiles	129	169	176	34	37	37
Chemicals and allied products	84	116	123	65	71	77
Motor vehicles and motor vehicles equipment	(1)	(1)	(1)	384	347	356
Other manufacturing	187	214	233	70	79	86
Nonmanufacturing	49	55	79	27	34	32

[1] Not separately available but included in "other manufacturing."
Source: National Science Foundation.

Industrial R&D expenditures related to pollution abatement dropped 1 percent between 1974 and 1975. This decrease can be attributed to firms in the motor vehicles industry whose pollution abatement R&D spending fell 10 percent. All other industry groups increased their pollution abatement R&D work between the 2 years.

When examined by type, auto emission R&D spending decreased 10 percent, reflecting cutbacks in the motor vehicles industry. For 1976 industry expects a further decline of 2 percent in overall pollution abatement R&D activities.

R&D FUNDS/NET SALES

The ratio of R&D spending to net sales for all R&D-performing manufacturing companies amounted to 3.1 percent in 1975, up from 3.0 percent the year earlier. This marked the first time since 1964 that this ratio has increased. This resulted primarily from a slower rate of growth in net sales between 1974 and 1975 than has occurred in previous years.

Of the six leading R&D-performing industries, increases in this ratio were registered in four. They were aircraft and missiles, 13.1 percent to 13.4 percent; electrical equipment, 6.9 percent to 7.1 percent; chemicals, 3.3 percent to 3.6 percent; and machinery, 3.9 percent to 4.0 percent. Only the motor vehicles and instruments industries showed decreases in this ratio of 3.7 percent to 3.5 percent and 5.4 percent to 5.3 percent, respectively. The drop in the motor vehicles industry reflected cutbacks in auto emission R&D work; the drop in the instruments industry reflected a 5-percent drop in Federal R&D funding to companies in the optical, surgical, photographic, and other instruments industry.

Table 3.—Industrial R&D expenditures for energy and pollution abatement by type: 1974-76
[Dollars in millions]

Type of energy	1974			1975			1976(est.)
	Total	Federal	Company	Total	Federal	Company	Total
Total	$1,213	$482	$731	$1,427	$620	$807	$1,577
Fossil fuel	507	13	494	549	31	518	591
Oil	325	3	322	335	5	330	353
Gas	74	(1)	(1)	76	(1)	(1)	75
Shale	13	(1)	(1)	14	(1)	(1)	13
Coal	65	9	56	98	22	76	116
Synthetic fuel	21	(1)	(1)	37	(1)	(1)	47
Mining	4	(1)	(1)	8	(1)	(1)	9
Other	39	6	33	53	15	38	60
Other fossil fuel	30	(1)	(1)	26	(1)	(1)	31
Nuclear	601	444	157	698	537	161	765
Fission	568	421	147	657	501	156	714
Fusion	34	23	11	42	36	6	51
Geothermal	2	(1)	(1)	7	(1)	(1)	10
Solar	7	(1)	(1)	18	(1)	(1)	35
Conservation and utilization	20	8	12	54	9	45	60
All other	76	14	62	100	30	70	116
Type of pollution abatement							
Total	657	51	606	651	44	607	662
Air	508	17	491	482	16	466	492
Automotive emission	383	(1)	(1)	345	(1)	(1)	361
Water	60	(1)	(1)	71	(1)	(1)	76
Solid waste	14	(1)	(1)	22	(1)	(1)	21
All other	75	29	46	76	23	53	74

[1] Not separately available but included in total.
Source: National Science Foundation.

BASIC RESEARCH, APPLIED RESEARCH, AND DEVELOPMENT

The distribution of industrial R&D funds in 1975 remained the same as in recent years with basic research at 3 percent, applied research at 19 percent, and development at 78 percent.

Between 1974 and 1975 industrial basic research expenditures increased 4 percent from $673 million to $700 million. About 40 percent of industrial basic research is performed by companies in the chemicals industry. An additional 27 percent is done by electrical equipment companies. This industry also showed the largest increase in basic research spending—6 percent.

Applied research spending by industry increased 6 percent between 1974 and 1975 to $4.4 billion. The chemicals industry is also the largest applied research spender with over 20 percent of the total. The electrical equipment industry was the second largest with almost 20 percent of the total in 1975.

Industrial development spending amounted to $18.4 billion in 1975, up 5 percent from 1974. The aircraft and missiles and electrical equipment industries were the two largest development performers in 1975 with over one-half the total. The machinery and motor vehicles industries accounted for an additional 25 percent. The largest increase in development spending occurred in the chemicals industry—15 percent.

R&D Scientists and Engineers

In January 1976 industry employed the full-time equivalent of 362,500 R&D scientists and engineers. This was an increase of 1 percent over the previous January's figure of 360,400 (table 1). All major industry groups remained at or near their January 1975 R&D professional employment levels in January 1976. Increases were recorded in eight industries and ranged from less than 2 percent in the stone, clay, and glass industry to 8 percent in nonmanufacturing. Decreases occurred in six industries and ranged from less than 1 percent in the electrical equipment industry to over 20 percent in other transportation equipment, the drop in the latter industry from 900 to 700.

The 1975 survey of industrial research and development is part of a comprehensive program undertaken and sponsored by the National Science Foundation to measure R&D activities in industrial firms, universities and colleges, nonprofit institutions, and government agencies. Industry data were collected and compiled by the Bureau of the Census, U.S. Department of Commerce. Complete results of the 1975 industrial survey and historical R&D data will appear in *Research and Development in Industry, 1975* to be available in the spring of 1977 from the Superintendent of Documents, U.S. Government Printing Office.

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